REMARKS

In view of the foregoing amendments and the following remarks, Applicants respectfully request reexamination of the present application. Claims 167, 218 and 223 have been amended, Claims 170, 171, 186, 187, 203, 204, 217, 229-231 and 234 have been cancelled and Claim 236 has been added.

More specifically, independent Claim 167 has been amended to insert the limitation of Claim 217 and Claim 217 has been cancelled. Further, Claims 170-171, 186-187 and 203-204 have been cancelled as being redundant to, or in conflict with, the amendment to independent Claim 167.

Independent Claim 218 has been amended to incorporate the limitation of Claim 234, and Claim 234 has been cancelled.

Independent Claim 223 has been amended to insert the limitation of dependent Claim 229 and Claim 229 has been cancelled. Claims 230-231 have been cancelled as being redundant to, or in conflict with, the amendment to Claim 223.

New Claim 236 has been added. Support for this amendment can be found on page 20, lines 6-16 of the present specification.

Applicants note with appreciation the Examiner's removal of the prior rejection under 35 U.S.C. § 112.

INVENTION SUMMARY

The present application is directed to an automated method for fabricating particles of a selected particle composition. Aerosol methods such as spray pyrolysis have been used to make a variety of small particles and also to deposit thin films onto substrates. However, most of these systems have been experimental in nature and unsuitable for production of commercially useful quantities of particles. As a result, many such systems do not provide any mechanism to adequately control the process parameters such as the quality of the aerosol, efficient use of the carrier gas and efficient collection methods that are necessary for commercial production. The present inventors conceived the method(s) disclosed in the present application for controlling the production of particles on a commercial scale.

CLAIM REJECTIONS – 35 USC § 103

The Examiner has rejected Claims 167-170, 172-174, 182-186, 191, 195-203, 205-207, 218-222, 223, 225, 226, 228 and 232-235 under 35 U.S.C. 103(a) as being obvious over U.S. Patent No. 3,840,391 by Spitz et al.

The Examiner states that Spitz et al. discloses using an ultrasonic generator to force a uniform aerosol including droplets of an aqueous solution of a metal compound and a carrier gas into a heated zone, where the heat causes droplets of the solution to vaporize.

With respect to the "automatically controlled at the direction of an electronic processor" limitation, the Examiner's position is that the electrical circuitry which turns the ultrasonic generator of the prior art on and off fully meets this limitation. The Examiner also states that with regard to the various functions that are "automatically" controlled, commenced, etc. in the instant claims, Spitz et al. discloses varying such parameters as power, frequency, concentration of aerosol, flow rate of gas, etc. to produce desired results; any changes in these parameters in order to better control the resulting products are held by the Examiner to fall within the scope of the various "automatic" steps as presently claimed. It is the Examiner's opinion that one of skill in the art would want to control such parameters in an efficient manner, and the use of electronic sensors, switches, etc. would provide a far greater degree of control than could possibly be achieved through manual observation and operation.

With respect to Claims 219-221, the Examiner notes that these claims are directed to completely optional steps, i.e., the claims recite a feature that only occurs in the event that the generating step is automatically interrupted. The Examiner also states that even so, it would have been an obvious expedient to one practicing the Spitz process to, in the event that one wishes to interrupt that process, cease supply of the precursor, the carrier gas, and heat input in order to avoid waste of materials and energy in the prior art process.

With respect to Claims 233-235, the Examiner states that these claims are directed entirely to mental steps associated with the processes of the independent claims (i.e., where one selects and processes instructions from memory) and thus cannot serve to render an otherwise known process patentable.

While the Examiner admits that Spitz et al. forms a film using the above-noted process, the Examiner states that Spitz et al. indicates that one conducts the process in

order to obtain a mean particle size of a few microns (Col. 3, lines 10 of Spitz et al.). The Examiner further states that the present claims do not define any particular size of any particles formed in the claimed process, and performing the Spitz et al. process on a small area of a substrate would involve forming a "particle" within the broad meaning of the term in the instant claims. Thus, the Examiner states that a prima facie case of obviousness is established between the disclosure of Spitz et al. and the presently claimed invention.

The Examiner has also rejected Claims 180 and 213-217 under 35 U.S.C. 103(a) as being unpatentable over Spitz et al. The Examiner admits that Spitz et al. does not disclose automatically testing a flow path of the aerosol stream for leaks prior to generating the stream (Claim 180). The Examiner's position is that one of ordinary skill in the art would be motivated to include such a step in any process which involves the use of aerosolized solution in order to avoid (i) potential waste, and (ii) potential spills of toxic chemicals and solutions in processes of the prior art. The Examiner states that it is axiomatic that one would desire to be assured that the equipment that is to be used in a given chemical process will be capable of properly performing the functions intended. Therefore, to incorporate the presently claimed pressure testing step prior to commencing the operations as described by Spitz et al. would be considered an obvious modification of what is disclosed by Spitz et al.

The Examiner also states that although Spitz et al. does not specify the various numerical limitations of Claims 213-216, processes including these limitations would fall within the purview of the Spitz et al. process, especially with regard to Claims 215 and 216 in light of Spitz et al. at Col. 3, line 10.

With respect to Claim 217, the Examiner states that the use of multiple generators in the same manner as the use of one generator in the prior art, to achieve nothing more than a cumulative and predictable effect thereof, cannot be said to define a patentable distinction from the prior art process.

The Examiner has rejected Claims 171, 187, 204 and 227 under 35 U.S.C. 103(a) as being unpatentable over Spitz et al. in view of U.S. Patent No. 4,801,411 by Wellinghoff et al. The Examiner states that Wellinghoff et al. indicates that the use of spray atomizers was an art recognized equivalent at the time of the invention to the use of ultrasonic generators.

The Examiner has also rejected Claims 177, 193, 209 and 230 under 35 U.S.C. 103(a) as being unpatentable over Spitz et al. in view of U.S. Patent No. 5,852,768 by Jacobsen et al.

The Examiner states that Jacobsen et al. indicates that it was known in the art to employ flame reactors as heaters in conjunction with a process of forming powders of uniform particle size from ultrasonic generators, i.e., in a process analogous to that of Spitz et al. Thus, the Examiner states that the combination of Spitz et al. and Jacobsen et al. would have rendered a process as presently claimed obvious to one of ordinary skill in the art.

The Examiner has also rejected Claims 178, 194, 210 and 231 (as amended) under 35 U.S.C. 103(a) as being unpatentable over Spitz et al. in view of U.S. Patent No. 5,180,949 by Durr.

The Examiner states that Spitz et al. does not disclose heating in a plasma reactor, as recited in the instant claims, but Durr indicates that it was known in the art to use a plasma induction coil for the purpose of heating an aerosol-containing material. Thus, the Examiner states that the combination of Spitz et al. and Durr would have taught the claimed invention to a person of ordinary skill in the art.

The Examiner has also rejected Claims 175, 179, 181, 188-190, 211, 212 and 224 under 35 U.S.C. 103(a) as being unpatentable over Spitz et al. in view of U.S. Patent No. 5,928,405 by Ranade et al.

The Examiner states that Spitz et al. does not disclose the use of cooling gas in order to cool the material produced in the Spitz et al. process. The Examiner also states that Ranade et al. indicates that it was conventional in the art, at the time of the invention, to employ cooling gases to cool powders produced from aerosol thermolysis of a solution, i.e., from a process analogous to that of Spitz et al. The Examiner states that all statements made *supra* with respect to one or more parameters being "automatically" controlled apply equally as well in this instance. The Examiner also states that the combination of Spitz et al. and Ranade et al. would have taught a process as presently claimed to a person of ordinary skill in the art.

INDEPENDENT CLAIM 167

Applicants have amended independent Claim 167 to incorporate dependent Claim

217, including the limitation that the aerosol stream is generated from an ultrasonic aerosol generator including a *plurality of ultrasonic transducers*.

With respect to Claim 217, the Examiner states that the use of multiple generators cannot be said to define a patentable distinction from the prior art process as it would achieve nothing more than a "cumulative and predictable effect". However, the Examiner has provided no line of reasoning as to why one of ordinary skill in the art would be motivated to modify Spitz et al. to provide additional ultrasonic generators based solely upon the disclosure of Spitz et al. The use of multiple ultrasonic generators is highly desired in accordance with the present application for the production of commercial quantities of particles, which requires the generation of a high volume of droplets in a high droplet concentration. In contrast, Spitz et al. is directed to the formation of a very thin film of material on a heated substrate. Increasing the volume of droplets and/or the droplet loading in the aerosol used by Spitz et al. through multiple transducers would provide no apparent advantage in the formation of a very thin film on a heated substrate. Thus, one of ordinary skill in the art would have no reason to modify the apparatus of Spitz et al. to include multiple transducers. Therefore, removal of this rejection is requested.

Claims 168-169, 172-216 and 233 depend upon Claim 167 and include all of the limitations of Claim 167.

These claims define further limitations that further distinguish the present invention over that disclosed by the prior art. For example, the Examiner states that "the present claims do not define any particular size of any particles formed in the claimed process." However, dependent Claim 215 recites that the weight average particle size of the particles is from 0.05 micron to 4 microns. Spitz et al. discloses the formation of a film and does not even disclose or suggest the formation of particles. The Examiner states that "performing the Spitz process on a small area of a substrate would involve forming a particle" within the broad meaning of the term in the instant claims." However, it is not clear to Applicants what the Examiner means by this statement. Spitz et al. is simply not directed to the formation of particles but is directed to the formation of a film on a heated substrate. A film is not the same as a particle, and it is not at all clear how, even under a broad definition of the term particle, Spitz et al. could be interpreted as disclosing particles having a size range of 0.05 micron to 4 microns. For these reasons, it is respectfully submitted that dependent Claim

215 is also allowable over Spitz et al. for these additional reasons.

Similarly, Claim 175 recites that the heater includes end caps and cooling at least one of the end caps. The Examiner states that Ranade et al. teaches this feature. Again, however, Spitz et al. is directed to the formation of a film on a substrate and Ranade et al. is directed to the fabrication of particles. There is absolutely no logical motivation to provide the method and apparatus of Spitz et al. with a reactor having cooled end caps, as is required by this claim as the aerosol of Spitz et al. is deposited onto a heated substrate. Likewise, Claim 179 requires introducing a cooling gas to the aerosol in an aerosol cooler. Again, the Examiner has provided no motivation, and Applicants know of none, for utilizing a cooling gas in the method and apparatus of Spitz et al.

With respect to Claim 233, the Examiner states that the claim is directed entirely to mental steps associated with the processes of the independent claims (i.e., where one selects and processes instructions from memory) and thus cannot serve to render an otherwise process patentable. However, Claim 233 does not recite a "mental step". Rather, it is a step where an electronic processor selects and processes instructions from memory having instructions stored therein. This is an entirely electronic process that is directed by the electronic processor. The electronic processor selects and processes instructions, not a user. It is submitted that Claim 233 is also allowable over the prior art for these reasons.

Also, new Claim 236 recites that the aerosol generator includes at least 9 ultrasonic transducers. Clearly, as is discussed above, there is no rational motivation to modify the apparatus of Spitz et al. to include 9 or more ultrasonic transducers.

INDEPENDENT CLAIM 218

Independent Claim 218 has been amended to incorporate the limitation of dependent Claim 234 and Claim 234 has been cancelled. More specifically, independent Claim 218 has been amended to recite that the generating aerosol stream is automatically interruptable at the direction of an electronic processor *that selects and processes instructions from memory having the instruction stored therein* for the manufacture of the particles.

In the Office Action, the Examiner stated that Claim 234 is directed entirely to mental

steps associated with the processes of the independent claims (i.e., where one selects and processes instructions from memory) and thus cannot serve to render an otherwise known process patentable. However, these are not "mental" steps. Rather, it is a step where an electronic processor selects and processes instructions from memory having instructions stored therein, that is, it is an entirely electronic process that is directed by the electronic processor. "One" (e.g., a human operator) does not select and process instructions, but rather the electronic processor selects and processes instructions.

In view of the foregoing, it is respectfully submitted that independent Claim 218 and dependent Claims 219-222 are also allowable over the prior art.

INDEPENDENT CLAIM 223

Independent Claim 223 has been amended to incorporate the limitation of Claim 229 and Claim 229 has been cancelled. Independent Claim 223 now recites that the heating is performed in a furnace having a plurality of heating zones and that the heat input into each of the heating zones is automatically independently controlled at the direction of an electronic processor. Spitz et al. does not disclose or suggest such a process, particularly since Spitz et al. is directed to the formation of a film on a heated substrate, and is not directed to the fabrication of particles. Therefore, removal of this rejection with respect to independent Claim 223 and dependent Claims 224-228, 232 and 235, which depend upon Claim 223 is requested.

DOUBLE PATENTING

The Examiner has maintained the rejection of Claims 176-235 on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1-104 of U.S. Patent No. 6,699,304 by Hampden-Smith et al.

The Examiner states that although the conflicting claims are not identical, they are not patentably distinct from each other because both the instant claims and the '304 claims are directed to processes of making particulate products by heating of an aerosol stream produced from an ultrasonic generator. The Examiner also states that while the '304 do not refer to any of the steps that are performed "automatically" as recited in the instant claims, the Examiner's position is that the act of turning the power on and off to the ultrasonic generators of the '304 claims, and/or of controlling the temperature of the heater and amounts of the aerosol and carrier gas in the '304 claims amount to "automatic" control of

these parameters in a broad sense as required by the instant claims. The Examiner states that thus, no patentable distinction is seen to exist between the process as defined in the instant claims and that defined in the claims of the '304 patent.

Although Applicants respectfully disagree with the Examiner's rejection, as was set forth by Applicants in the previous response, Applicants nonetheless submit a Terminal Disclaimer and fee to remove this rejection and expedite prosecution of the present application.

It is not believed that any additional fees are due with respect to this filing, however please debit any necessary additional fees to Deposit Account No. 50-1419.

Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecute and or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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